

Appl. No. 10/748,961
Amendment to Office Action of 12.29.2004

Remarks:

In the Drawings:

The Examiner objected the drawings because the drawings did not show the feature concerning the thickness of the metallic tube layer as expressed in "atomic layers". The applicant is baffled by this objection. No where is it required in 37 CFR 1.83(a) or anywhere else that dimensions be indicated on a drawing. The Examiner is referred to Figures 2 & 4, for instance, where the metallic tube layer is clearly and unmistakably identified as element "5". Further, the metallic tube layer is identified in numerous places in the specification, such as in the List of Figure Reference Numerals. The objection should be removed.

The applicant suspects the Examiner's drawing objection stems from the Examiner's erroneous 35 USC 112 rejection concerning the use of atomic layers as a measure of the thickness of the metallic tube layer. This rejection is discussed in detail below.

In the Specification:

The Examiner objected to specification for failing to provide proper antecedent basis for the claimed subject matter concerning the specification of the thickness of the metallic tube layer in atomic layers. The objection is also in error. The original as-filed claims 14 & 16 specifically mention the thickness of metallic tubular layer in terms of atomic layers. It is well known and well established law that the original as-filed claims are part of the specification. However, the Applicant has amended the first full paragraph on page 8 to indicate the thickness range of the metallic tube layer in the same ranges specified in the above mentioned claims. The objection should be removed.

Again, the Applicant suspects the Examiner's specification objection stems from the Examiner's erroneous 35 USC 112 rejection concerning the use of atomic layers as a measure of the thickness of the metallic tube layer. This rejection is discussed in detail below.

In the Claims:

REJECTION OF CLAIMS 14-17 UNDER 35 USC 112, SECOND PARAGRAPH:

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Claim 14 recites, "a metallic interior tubular layer having a thickness of between 10-1000 atomic layers". Claim 16 recites, "the metallic interior tubular layer has a thickness of between about 10-18 atomic layers". The Examiner contends that thickness cannot be measured by atomic layers but only inch or meter. This is incorrect. Rather, determination of the thickness of a particular metallic tube layer in either inches or meters (if so desired) can be determined with ease based on (i) the atomic size of the metallic material comprising the particular metallic tube layer (the atomic sizes of metals are well known) and (ii) the number of atomic layers of material comprising the particular metallic tube layer. Simply, the atomic size of the metal is multiplied by the number of atomic layers. This is definitely not indefinite. It is true that the thickness in inches or meters will vary with the material comprising the metallic layer as different metals have different atomic sizes, but the critical factor relating to the aforementioned claims is not the thickness of the metallic tube layer in inches or meters but atomic layers. For a deeper understanding the Examiner is invited to read Appendix A: "How X-Rays Work" as drafted by the Inventor/Applicant, which will give the Examiner a better understanding of why the thickness is specified in atomic layers.

The Examiner is further directed to Appendix B, which comprises the text of patent 4,684,565, wherein the thickness of coatings relating to X-ray mirrors are described in atomic layers. See the highlighted material on page 3. This reference is merely exemplary. With minimal searching the Examiner can find additional patent and other references where the thickness of thin layers of material are provided in atomic layers. See Appendix C that provides a list of patents in which the phrase "atomic layers thick" occurs for U.S. patents issued since 1976. Note that 67 patents are listed. There is absolutely no question that one of ordinary skill in the art would find the use of atomic layers to denote thickness as definite.

The 35 USC 112 rejections of claims 14-17 should be removed.

INDEPENDENT CLAIM 1 (AS AMENDED) AND ITS ASSOCIATED DEPENDANT CLAIMS:

Claim 1 was rejected by the Examiner as being anticipated under 35 USC 102 by Plessis.

Claim 1 (as amended) is not anticipated nor rendered obvious by Plessis for each of the following reasons:

A. Plessis teaches only a single tubular anode wherein claim 1 recites, "a plurality of X-ray anodes, each in the form of a capillary tube". No teaching or motivation for using more than

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a single tubular anode is suggested in Plessis. Accordingly, claim 1 and all its dependent claims are in a condition of allowance for at least this reason.

The Examiner contends having multiple anodes would be obvious to one of ordinary skill as a mere duplication in his 35 USC 103 rejection of claim 5. The Examiner provides absolutely no support for his contention, however. The Examiner is directed to *In re Lee*, 277 F.3d 1338 (Fed. Cir. 2002) where the court held that the patent office is not permitted to merely label something as obvious for purposes of rejecting a claim without providing support for its position. An equivocal statement such as "a change in duplication of a component is generally recognized as being within the level of ordinary skill in the art." The Applicant requests that the Examiner provide support for this position if he intends to maintain a 103 rejection concerning the use of a plurality of tubular anodes.

B. Claim 1 specifically requires each tubular anode to comprise a "capillary tube".

Capillary tubes by definition are very small in internal diameter. See, for example, Answers.com. Essentially, a capillary tube must be small enough in diameter to be capable of holding a liquid therein by way of surface tension against the force of gravity (i.e. capillary action). Plessis does not suggest that the tubular anode it teaches is very small. To the contrary, the title suggests the x-ray beam generated by the x-ray tube is a "pencil beam" indicating a much large tubular anode is utilized. To the applicant's knowledge, no one has suggested, taught or motivated the use of capillary tube x-ray anodes alone or in a plurality. Accordingly, claim 1 and all its dependent claims are in a condition of allowance for at least this reason.

C. Claim 1 specifically requires that the interior surface of the bore of the anode comprise a metallic tube layer having a thickness of no more than 10-1000 atomic layers. The actual dimension of the thickness of the layer in angstroms will vary with the metal comprising the anode. Interestingly, the Examiner, when rejecting claims 14 and 16 of the as-filed application, ignored the specific thickness requirement of the metal tube layer as listed in those claims. The Examiner is reminded that a reference (in this case Plessis) must teach implicitly or explicitly EVERY limitation of the claim in order to present a valid prima facie case of anticipation. As discussed above, the Applicant requests that the Examiner read "How X-rays work" written by the Applicant/Inventor for a better understanding behind the use of a very thin metallic tube layer in a capillary tube anode. Accordingly, claim 1 and all its dependent claims are in a condition of allowance for at least this reason.

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D. Claim 1 specifically requires that the plurality of X-ray anodes “include at least a first linear row of anodes and a second linear row of anodes, the metallic tube layer of each anode of the first linear row comprising a first metallic material and the metallic tubular of each anode of the second linear row comprising a second metallic material, the first metallic material being different than the second metallic material.” Nothing in Plessis teaches, suggests or motivates the use of linear rows of tubular anodes, especially when at least one row comprises a different anode material than at least one other row.

In as-filed claims 2&3, the Examiner rejected the use of differing anode materials in the metallic tubular layers of different tubular anodes as being obvious in view of Plessis over Zhou. First, the argument provided by the Examiner is nonsensical: he states that Zhou teaches “at least one tube type X-ray anode (1402) and at least one second x-ray anode (1404)...”. The reference numbers relate to Zhou’s figure 14 which does not illustrate a tube-type anode. Nor does Zhou discuss a tube-type anode anywhere within its specification. The Applicant can only guess at what the Examiner means by his written statement. Review of the written discussion of Figure 14 indicates that only a single anode (1400) is illustrated but that anode has two target materials arranged thereon (1402 & 1404). The anode is not tubular but frustoconical. See column 14, lines 20-25. In sharp contrast, as-filed claims 2 & 3 and now claim 1 (as amended) teach two SEPARATE tubular anodes. Plessis and Zhou might be combined to indicate a single tubular anode (from Plessis) having two different anode (Zhou) materials lining its bore, but no combination of Plessis and Zhou will produce that alone motivate having separate tubular anodes with each anode having a metallic tube layer made of a different metallic material than the other anode.

Even if, for sake of argument only, we assume that the combination of Zhou and Plessis does render the as-filed claims 2 & 3 obvious, nothing in either reference teaches, suggests or motivates two linear rows of tubular anodes wherein each row has metallic tube layers of different materials. This particular arrangement is described in the present application in relation to Figures 6A and 6B.

Accordingly, claim 1 and all its dependent claims are in a condition of allowance for at least these reasons.

Concerning dependent claim 4 (as filed), the Examiner contends that Zhou teaches an electron beam deflector. The portion of the Zhou reference cited by the Examiner does not do so explicitly but at best implicitly. However, Zhou (alone or in combination with Plessis) fails to

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teach, suggest or motivate, implicitly or explicitly, a electron beam deflector that is "adapted to selectively deflect the focused beam of electrons along one of the first and second linear rows" as is specifically required by claim 4 (as amended). For at least this additional reason along with all the reasons provided above for claim 1, claim 4 is in a condition of allowance over the relied upon references.

INDEPENDENT CLAIM 14 AND ITS DEPENDENT CLAIMS:

The Examiner rejected claim 14 as being anticipated by Plessis. However, Plessis fails to teach, suggest or motivate the use of a metallic interior tubular layer having a thickness of between 10-1000 atomic layers. While the Examiner contends that a thickness measurement specified in atomic layers is indefinite, he is then not free to just ignore a limitation in a claim and accordingly reject the claim. Given that the Applicant has clearly demonstrated above that the use of atomic layers to denote a thickness measurement is common and definite, claim 14 and all its dependent claims are now in a condition of allowance over the relied upon references.

Further, concerning claim 14, the Examiner contends element 4 as specified in various figures of Plessis teaches, suggests or motivates "an X-ray absorbing layer" as required in claim 14. A review of the Plessis specification merely indicates that element 4 references the entirety of the tubular anode. Plessis suggests that the anode is primarily comprised of copper in column 4, lines 19-23 while an interior liner of the anode is made of tungsten. Copper is not a good X-ray absorber for Tungsten. In fact, X-rays generated from the collision of an electron beam with tungsten will pass through copper relatively unhindered. The general rule concerning x-ray absorption is that for a metallic material to absorb x-rays of another metallic material from which the X-rays were generated, it must be denser than the other metallic material. The more dense the absorbing material, the more effective it is. For instance, copper (atomic number 29) would not effectively absorb x-ray radiation generated from its near neighbors such as Nickel (28), Cobalt (27), Iron (26), Manganese (25), Chromium (24), Vanadium (23) and Titanium (22) despite being denser than those materials, because they are relatively close in density. Tungsten, the only anode material mentioned by Plessis has an atomic number of 74 and accordingly, tungsten x-ray radiation would pass through the copper relatively unhindered. Accordingly, Plessis, alone or in combination with the relied upon references, fails to anticipate or render obvious the use of an X-ray absorbing

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layer as recited in claim 14. For at least this reason, claim 14 and all its dependent claims are now in a condition of allowance over the relied upon references.

INDEPENDENT CLAIM 18 AND ITS DEPENDENT CLAIMS:

Claim 18 was rejected by the Examiner as being anticipated by Plessis. Claim 18 (as-amended) requires that an electron beam a generator be directed into first ends of a first linear array of capillary tube anodes. Plessis only teaches, suggests or motivates a single x-ray tube. As discussed above, Zhou does not teach, suggest or motivate having more than one distinct anode wherein the anodes are arranged linearly relative to each other. None of the other relied upon references teach, suggest or motivate a linear array of anode tubes. Further, as discussed above with reference to claim 1, Plessis does not teach capillary tube anodes, which have extremely small diameters. The tubular construction of the anode coupled with their very small size results in x-rays being generated that essentially comprise characteristic line spectra relative to the particular metallic anode material. All other X-ray tube anodes, such as Plessis, also generate a significant amount of continuous spectrum X-ray radiation. The extremely small diameter of the capillary tube anodes essentially filters out the continuous spectrum radiation as is described in Appendix A, "How X-rays Work". For at least these reasons, claim 18 and its dependent claims are in a condition of allowance over the relied upon prior art.

CLAIM 6

The Examiner found Claim 6 to comprise allowable subject matter. The Applicant has rewritten Claim 6 in independent format and it is therefore in a condition of allowance.

Petition for Extension of Time

The Applicant respectfully requests a one month Extension of time. Authorization to charge the one month extension fee for a small entity is provided herewith.

Conclusion

The applicant believes the objections and the rejections of the Office Action have been overcome through amendment and remark. Accordingly, the application and all pending claims are

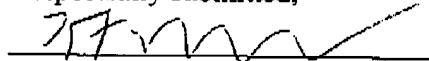
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in a condition of allowance. The Examiner is respectfully requested to contact the undersigned at 303.768.0644 if there are any other outstanding issues that would prevent the expeditious issuance of a Notice of Allowance in this case.

19th day of April, 2005
Dated this 27th day of April, 2005

Respectfully submitted,



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